Chapter 3

New Instrument Approach Procedures

Although substantial increases in capacity are best achieved through the building of new airports and new runways at existing airports, large projects like these are only completed after a long-term process of planning and construction. In an effort to meet the increasing demands on the aviation system in the near-term, the FAA has initiated improvements in air traffic control procedures designed to increase utilization of multiple runways and provide additional capacity at existing airports, while maintaining or improving the current level of safety in aircraft operations.

In FY93, more than half of all delays were attributed to adverse weather conditions. These delays are in part the result of instrument approach procedures that are much more restrictive than the visual procedures in effect during better weather conditions. Much of this delay could be eliminated if the approach procedures used during instrument meteorological conditions (IMC) were closer to those observed during visual meteorological conditions (VMC).

During the past few years, the FAA has been developing new capacity-enhancing approach procedures. These are multiple approach procedures aimed at increasing the number of airports and runway combinations that can be used simultaneously, either independently or dependently, in less than visual approach conditions.[1] "Independent" procedures are so called because aircraft arriving along one flight path do not affect arrivals along another flight path. "Dependent" procedures place restrictions between two arrival streams of aircraft because their proximity to each other has the potential for some interference. The testing of these new procedures has been thorough, involving various validation methods, including real-time simulations and live demonstrations at selected airports.

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During the past few years, the FAA has been developing new capacity-enhancing approach procedures aimed at increasing the number of airports and runway combinations that can be used simultaneously in less than visual approach conditions.

As a result of these efforts, new technologies have been implemented and new national standards have been published that enable the use of these capacity-enhancing approach procedures.

1. In general, depending on the airport's aircraft mix, single-runway IFR approach procedures allow about 29 arrivals per hour. Hence, two simultaneous approach streams, when operating independently of each other, double arrival capacity to 57 per hour. Three streams would allow 86 hourly arrivals, and so on. Such procedures are called independent, because arriving aircraft in one stream do not interfere with arrivals in the other. Conversely, "dependent" procedures place restrictions between the aircraft streams, and, as a result, hourly capacity for dual dependent approaches is somewhere between 29 and 57 arrivals. In the case of dependent triple streams, the arrival capacity is somewhere between 57 and 86, depending on airport runway configuration.

As a result of these development efforts, new technologies have been implemented and new national standards have been published that enable the use of these capacity-enhancing approach procedures.

- Simultaneous (independent) parallel approaches using the Precision Runway Monitor (PRM) to runways separated by 3,400 to 4,300 feet — published November 1991. The first PRM was commissioned at Raleigh-Durham International Airport in June 1993.
- Improved dependent parallel approaches to runways separated by 2,500 to 4,299 feet that reduce the required diagonal separation from 2.0 to 1.5 nm — published June 1992.
- Reduced longitudinal separation on wet runways from 3 to 2.5 nm inside the final approach fix (FAF) — published June 1992.
- Dependent converging instrument approaches using the Converging Runway Display Aid (CRDA) — published November 1992. The ARTS IIIA CRDA software upgrade is available for installation.
- Use of Flight Management System (FMS) computers to transition aircraft from the en route phase of flight to existing charted visual flight procedures (CVFP) and instrument landing system (ILS) approaches — published December 1992.
- Simultaneous ILS and localizer directional aid (LDA) approaches — procedures implemented at San Francisco International Airport.

The following sections present a brief description of the most promising approach concepts currently under development, including their estimated benefits, supporting technology, and candidate airports that might benefit from the new procedures. The busiest 100 airports are listed in Table 3-7 (described in Section 3.10), together with the new procedures that each can potentially use. Site-specific analysis is needed to determine which procedures are most beneficial to each airport.

3.1 Independent Parallel Approaches Using the Precision Runway Monitor (PRM)

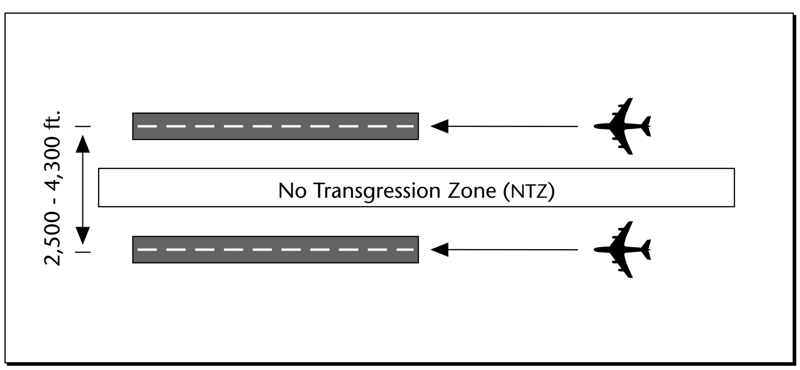
The FAA has authorized independent (simultaneous) instrument approaches to dual parallel runways since 1962, doubling the arrival capacity of an airport when visual approaches cannot be conducted. Initially, the spacing between the parallel runways was required to be at least 5,000 feet, but, in 1974, this was reduced to 4,300 feet. More than 15 U.S. airports are currently authorized to operate such independent parallel instrument approaches. A new national standard published in November 1991 authorized simultaneous (independent) parallel approaches to runways separated by 3,400 to 4,300 feet when the Precision Runway Monitor is in use.

The PRM system consists of an improved monopulse antenna system that provides high azimuth and range accuracy and higher data rates than the current terminal Airport Surveillance Radar (ASR) systems. The E-SCAN radar uses an electronic scanning antenna which is capable of updating an aircraft's position every half second. This update rate is an order of magnitude greater than the current ASR systems. The PRM processing system allows air traffic controllers to monitor the parallel approach courses on high-resolution color displays and generates controller alerts when an aircraft blunders off course.

Demonstrations of PRM technology were conducted at Raleigh-Durham International Airport in 1989 and 1990 using the E-SCAN radar. The first PRM system (E-SCAN) was commissioned at Raleigh Durham International Airport in June 1993. Additional systems are scheduled for delivery starting in the latter part of 1994.

It is anticipated that in 1995 simulations will be conducted at the FAA Technical Center to determine the minimum runway spacing, down to 2,500 feet, for independent parallel approaches using a PRM. Figure 3-1 illustrates these parallel instrument approaches using PRM. If successful, the average capacity gains expected from the use of these improved approaches would be 12-17 arrivals per hour.

Figure 3-1. Independent Parallel Instrument Approaches Using the Precision Runway Monitor (PRM)



3.2 Independent Parallel Approaches Using the Final Monitor Aid (FMA) with Current Radar Systems

The Final Monitor Aid is a high resolution color display that is equipped with the controller alert hardware and software that is used in the PRM system. The display includes alert algorithms that provide aircraft track predictors; a color change alert when an aircraft penetrates or is predicted to penetrate the no transgression zone (NTZ); a color change alert if the aircraft transponder becomes inoperative; and digital mapping.

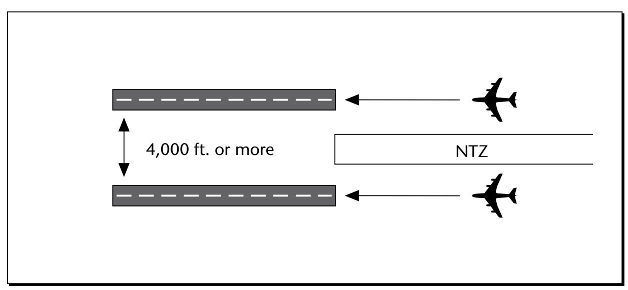
Studies revealed that using the FMA with current radar systems (4.8 second update rate) would improve the ability of controllers to detect blunders, thereby allowing a reduction in the minimum centerline spacing for independent parallel approaches. Real-time simulations, utilizing a larger “miss-distance” of 500 feet to allow for the possible effects of wake vortex, have been completed at the FAA Technical Center for dual and triple parallel runways spaced 4,300 feet apart. Data from these simulations are being analyzed, and, if the results are favorable, procedures will be published in 1994. Further simulations will be conducted for parallel runways spaced 4,000 feet apart. Figure 3-2 illustrates parallel instrument approaches using the FMA. Table 3-1 lists airports that have, or plan to have, parallel runways separated by 4,000 feet or more and indicates the average capacity gains expected from these improved approaches.

Table 3-1. Candidate Airports for Independent Parallel Approaches Using the Final Monitor Aid (FMA)

Candidates Among Top 100 Airports Average Capacity Gain 12-17 Arrivals/Hour		
Denver (DEN)*	Little Rock	Orlando
Detroit	Memphis	Phoenix
Grand Rapids	Nashville	Pittsburgh

* The new Denver International Airport.

Figure 3-2. Parallel Instrument Approaches Using the Final Monitor Aid (FMA)



3.3 Independent Parallel Approaches to Triple and Quadruple Runways Using Current Radar Systems

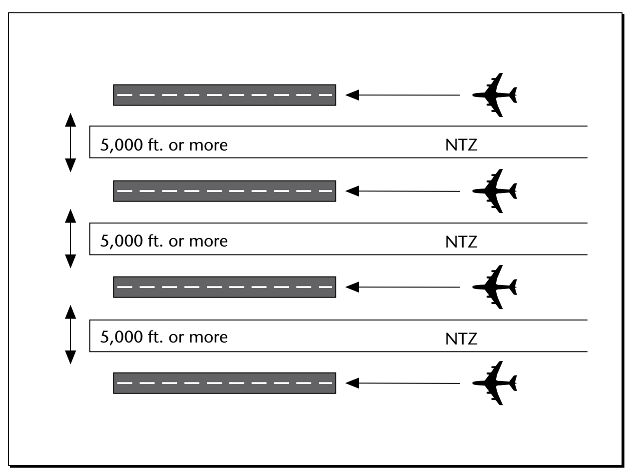
Several airports, including Dallas-Fort Worth, Orlando, and Pittsburgh, are planning on building parallel runways that will give them the capability to conduct triple and quadruple independent parallel approaches. This could result in as much as a 50 percent increase in arrival capacity for triple parallel arrivals and a 100 percent increase for quadruple arrivals.

Procedures allowing triple independent approaches to parallel runways separated by 5,000 feet at airports with field elevations of less than 1,000 feet with current radar systems were published in May 1993. Simulations for development of procedures for quadruple approaches are tentatively planned for 1995. Figure 3-3 illustrates triple and quadruple parallel approaches. Additional simulations will be conducted to determine the minimum runway spacing (less than 5,000 feet) for independent parallel approaches to triple and quadruple runways. Table 3-2 lists airports that have or plan to have parallel runways separated by 2,500 to 4,300 feet and indicates the average capacity gains expected from these improved approaches.

Table 3-2. Candidate Airports for Independent Parallel Approaches to Triple and Quadruple Runways

Candidates Among Top 100 Airports Average Capacity Gain 30 Arrivals/Hour
Dallas-Ft. Worth Denver (DEN)* Orlando Pittsburgh
* The new Denver International Airport.

Figure 3-3. Triple and Quadruple Parallel Approaches



3.4 Simultaneous Operations on Wet Intersecting Runways

Currently, simultaneous operations on intersecting runways require that the runways be dry. Over the past several years, demonstrations have been conducted at various airports using simultaneous operations on wet runways. Due to the success of these demonstrations, the FAA has initiated action to establish a national standard for allowing simultaneous operations on intersecting wet runways.

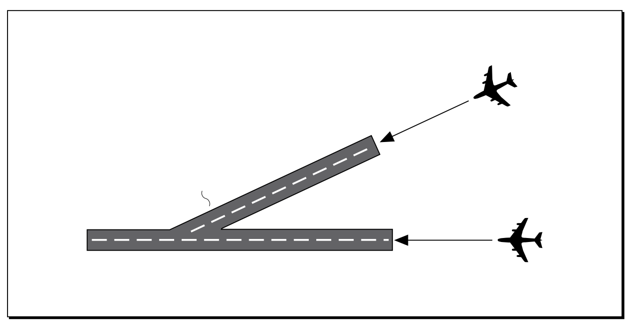
Of the top 100 airports, 60 currently conduct simultaneous operations on intersecting runways. Demonstrations have been ongoing at Boston Logan, Greater Pittsburgh, and Chicago O'Hare. Demonstrations are planned at New York's Kennedy, Philadelphia, and Miami International Airports. At O'Hare, increases of up to 25 percent have been experienced during wet runway operations.

An FAA team is in the process of formalizing procedures for these types of operations so that a national standard for simultaneous operations on wet intersecting runways can be established. The target date for implementation is the last quarter of FY94. Figure 3-4 illustrates simultaneous operations on wet intersecting runways. Table 3-3 lists airports that are candidates to conduct simultaneous operations on wet intersecting runways.

Table 3-3. Candidate Airports for Simultaneous Operations on Wet Intersecting Runways

Candidates Among Top 100 Airports Top 13 Candidate Airports		
Boston	Maimi	Philadelphia
Charlotte/Douglas	Minneapolis-St. Paul	Pittsburgh
Chicago O'Hare	New York (JFK)	San Francisco
Detroit	New York (LGA)	Washington National
	St. Louis	

Figure 3-4. Simultaneous Operations on Wet Intersecting Runways



3.5 Improved Operations on Parallel Runways Separated by Less Than 2,500 Feet

Current procedures consider parallel runways separated by less than 2,500 feet as a single runway during IFR operations. Simultaneous use of these runways for arrivals and departures is prohibited. This imposes a significant capacity penalty at numerous high-density airports. A recent analysis determined that airports such as Boston Logan International and Philadelphia International could achieve delay savings of over 80,000 hours per year if they were able to run dependent parallel arrivals. Table 3-4 lists airports that are candidates to conduct improved operations on parallel runways separated by less than 2,500 feet.

The FAA's Wake Vortex Program has been redefined to focus directly on the safety requirements for arrival and departure operations to parallel runways separated by less than 2,500 feet. It is anticipated that, among other things, the program will provide evidence supporting a reduction in the 2,500 foot requirement under most meteorological conditions.

Table 3-4. Candidate Airports for Improved Operations on Parallel Runways Separated by Less Than 2,500 Feet

Candidates Among Top 100 Airports		
Atlanta	Long Beach	Palm Beach
Boise	Los Angeles	Philadelphia
Boston	Memphis	Phoenix
Chicago Midway	Midland	Pittsburgh
Cincinnati	Milwaukee	Providence
Cleveland	Nashville	Raleigh-Durham
Dallas-Ft. Worth	New Orleans	Reno
Des Moines	New York (JFK)	San Antonio
Detroit	Newark	San Francisco
El Paso	Norfolk	San Jose
Houston Hobby	Oakland	Santa Ana
Houston Intercont'l	Oklahoma City	Seattle-Tacoma
Islip	Omaha	St. Louis
Knoxville	Ontario	Tucson
Las Vegas	Orlando	Washington Dulles

3.6 Dependent Approaches to Three Parallel Runways

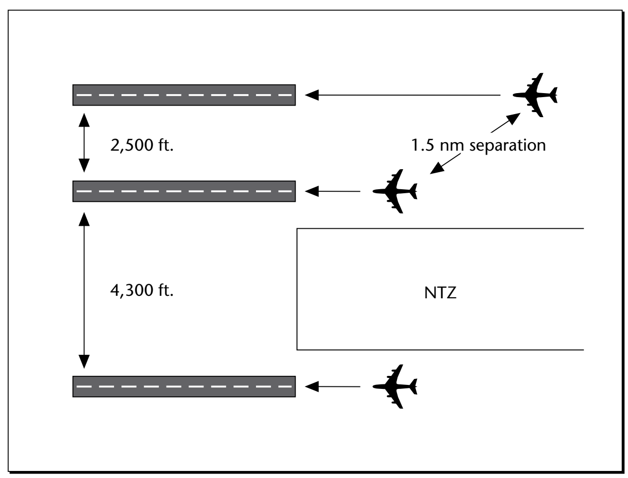
Procedures have been proposed that would allow approaches to three parallel runways when two may be operated independently of each other because of sufficient spacing and the third is dependent upon one of the others because of insufficient spacing. Currently, procedures allow simultaneous approaches to runways with centerlines spaced at least 3,400 feet apart, provided a Precision Runway Monitor (PRM) is available. However, those airports with spacing from 2,500 to 3,400 between one set of runways and 3,400 or 4,300 feet or more between the other set are limited to dual runway operations. Real-time simulations will be scheduled in the near future to test proposed procedures that will allow triple operations using dependent operations between one set of parallels and independent operations between the other set. Figure 3-5 illustrates independent and dependent parallel approaches, and Table 3-5 lists airports that are candidates for these improved approaches.

Table 3-5. Candidate Airports for Dependent Approaches to Three Parallel Runways

Candidates Among Top 100 Airports Average Capacity Gain 15 Arrivals/Hour		
Charlotte/Douglas	Detroit	Pittsburgh
Chicago O'Hare	Houston Intercont'l	Salt Lake City
Denver (DEN)*	Orlando	Washington Dulles

* The new Denver International Airport.

Figure 3-5. Independent and Dependent Parallel Approaches



3.7 Simultaneous (Independent) Converging Instrument Approaches

Under VFR, it is common to use converging runways for independent streams of arriving aircraft. In 1986, the FAA established a procedure for conducting independent instrument approaches to converging runways under instrument meteorological conditions (IMC). The procedure uses non-overlapping Terminal Instrument Procedures (TERPS) obstacle-clearance surfaces as a means of separation for aircraft executing simultaneous missed approaches. It assumes that each of the aircraft executing a turning missed approach can keep its course within the limits of its respective TERPS obstacle-free surface. The procedure also requires a 3 nm separation between the missed approach points (MAPs) on each approach. “TERPS+3” (as this procedure is often called) requires no dependency between the two aircraft on the converging approaches.

However, in order to keep the two MAPs 3 nm apart and ensure the TERPS surfaces do not overlap, the MAPs have to be moved back, away from the runway thresholds. This increases the separation between the TERPS surfaces and results in higher decision heights. Many runway configurations require decision heights greater than 700 feet in order to satisfy the TERPS+3 criteria. This restricts the application of the procedure to operations close to the boundary between VFR and IFR and limits the number of airports that could benefit from the procedure. The procedure cannot be used if the converging runways intersect; unless controllers can establish visual separation, and the ceiling and visibility are at or above 700 feet and 2 statute miles (sm).

In an effort to refine the independent converging approach procedures, a multi-disciplined work group, the Converging Approach Standards Technical Working Group (CASTWG), has been formed. This working group is analyzing various concepts which would result in lower approach of minimums.

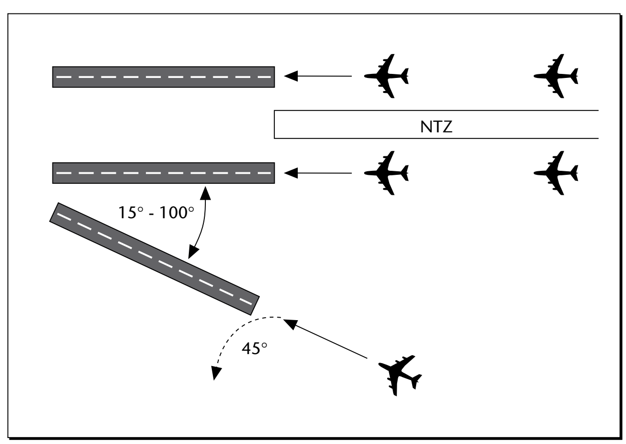
Data is being collected using various types of flight simulators to establish and/or validate required TERPS surfaces. Following the data collection and analysis, real-time simulations with controller and pilot participation may be conducted using radar laboratory and flight simulator demonstrations for further validation. Preliminary analysis indicates that several high-density airports will benefit from this refined independent converging instrument approach procedure. Figure 3-6 illustrates triple approaches, with dual parallels and one converging. Table 3-6 lists airports that are candidates to conduct these independent converging approaches and indicates the average capacity gains expected from these improved approaches.

Table 3-6. Candidate Airports for Independent Converging Approaches

Candidates Among Top 100 Airports Average Capacity Gain 30 Arrivals/Hour		
Baltimore	Houston Intercont'l	Oakland
Boston	Indianapolis	Omaha
Charlotte	Jacksonville	Philadelphia
Chicago Midway	Kansas City	Pittsburgh
Chicago O'Hare	Louisville	Portland
Cincinnati	Miami	Providence
Dallas-Ft. Worth	Milwaukee	Rochester
Dayton	Minneapolis	San Antonio
Denver (DEN)*	Nashville	San Francisco
Detroit	New York (JFK)	St. Louis
Ft. Lauderdale	New York (LGA)	Washington Dulles
Honolulu	New Orleans	Windsor Locks
Houston Hobby	Newark	

* The new Denver International Airport.

Figure 3-6. Triple Approaches: Dual Parallels and One Converging



3.8 Dependent Converging Instrument Approaches

Typically, independent converging IFR approaches using the TERPS+3 criteria are feasible only when ceilings are above 700 feet, depending upon runway geometry. As an alternative precision approach procedure, dependent IFR operations can be conducted to much lower minimums, usually down to Category I, thus expanding the period of time during which the runways can be used. However, to conduct these dependent operations efficiently, controllers need an automated method for ensuring that the aircraft on the different approaches remain safely separated. Without such a method, the separation of aircraft would be so large that little capacity would be gained.

A program was conducted at St. Louis (STL) to evaluate dependent operations using a controller automation aid called the Converging Runway Display Aid (CRDA) (also called ghosting or mirror imaging) to maintain aircraft stagger on approach. The CRDA displays an aircraft at its actual location and simultaneously displays its image at another location on the controllers scope to assist the controller in assessing the relative positions of aircraft that are on different approach paths. Results at St. Louis have shown an increase in arrival rates from 36 arrivals per hour to 48 arrivals per hour. National standards for this procedure were published in November 1992. The CRDA function is implemented in version A3.05 of the ARTS IIIA system.

The CRDA may also have other applications (see Section 5.2.1.1). For example, it could be used at airports with intersecting runways that have insufficient length to allow hold-short operations. Insufficient runway length between the threshold and the intersection with another runway can be ignored if arrivals are staggered such that one is clear of the intersection before the other crosses its respective threshold.

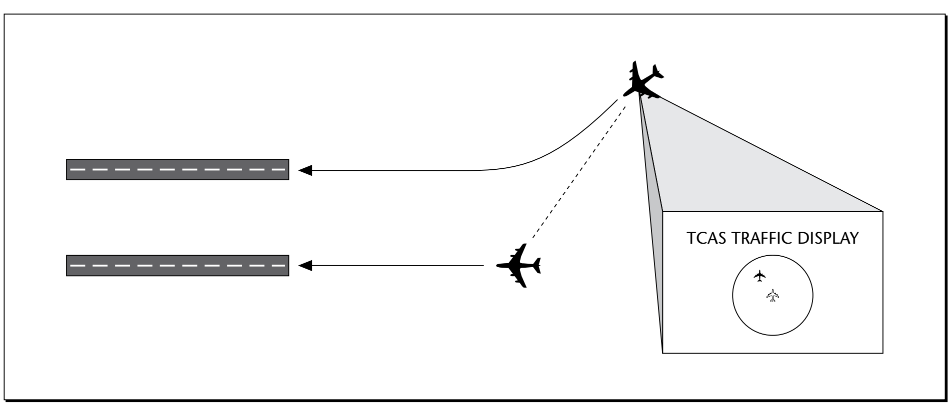
3.9 Traffic Alert and Collision Avoidance System (TCAS)/ Cockpit Display of Traffic Information (CDTI) for Separation Assistance

The cockpit display of traffic information associated with the Traffic Alert and Collision Avoidance System can provide the mechanism for flight crews to assist air traffic controllers in reducing the spacing tolerances that are maintained between aircraft for many phases of flight. Figure 3-7 illustrates one example of this use of TCAS/CDTI. The use of this information should result in capacity improvements beyond those which are available using radar and voice communications only.

A TCAS/CDTI feasibility study was published in April 1991. From that study, efforts are moving forward to conduct concept and interactive simulations that will eventually lead to refined ATC procedures. Data and information gathering is underway and preliminary concept simulations are being devised for testing in an integrated laboratory environment. Further, the use of full-motion simulators will evaluate the validity of proposed TCAS/CDTI applications in enhancing efficiency and capacity.

Initial emphasis has been on the use of TCAS/CDTI to support oceanic climbs and descents. In this application, the TCAS traffic display is used to determine a minimum safe distance when one aircraft wants to climb or descend through the altitude of another aircraft. Air traffic control then uses the information provided to them by the flight crew to issue an appropriate clearance. The inaugural validation flight for this procedure occurred in April 1994 over the Pacific Ocean. Further applications that take advantage of the TCAS capabilities are being explored to improve operational efficiency.

Figure 3-7. TCAS/CDTI for Separation Assistance



3.10 Approach Procedure Applicability at the Top 100 Airports

Table 3-7 shows the applicability of current and proposed procedures for the top 100 airports. The first column shows the current best hourly arrival capacity and the approach procedure utilized to achieve that capacity. The following columns show which of the proposed procedures discussed in the previous sections are applicable. It is important to bear in mind that this table is based on runway approach diagrams; factors such as noise, obstructions, and community concerns were not considered. Some airports may not be using their "current best" approach procedures. In addition, the actual aircraft fleet mix at each airport was not used; the capacity figures are numbers which are reasonable approximations of real capacity, used for comparison only. The objective of the table is to provide initial information on the applicability of approach procedures being developed by the FAA.

An asterisk (*) indicates that the proposed approach procedure in the column in question is applicable at a given airport, however, it also means that either the current best procedure, or another proposed approach procedure (under new rules), provides equal or better arrival capacity. A "p" indicates that the approach procedure may be applicable if and when proposed construction/extension plans actually take place. Some of this construction is in progress, and some is only at the proposal stage. A blank space indicates either that the runways do not support the proposed procedure, it is a borderline application, or there is not enough information to determine applicability. Finally, in order to highlight new approach procedures that would provide better capacity than any other procedures (current or proposed), an asterisk was replaced by a capacity number wherever the new procedure can provide higher capacity than any other. The number indicates the hourly arrival capacity of the procedure in question. It is easy to identify the most beneficial improvement by looking at the "New Approach Procedure" section in each row.

Table 3-7. Potential Siting of New IFR Approach Procedures and Their Associated IFR Arrival Capacity[2]

Airport	Airport Code	Current Best IFR Arrival Capacity (App Procedure)[3]	New IFR Approach Procedures Depen. Parallel	Indepen. Parallel	CRDA	TERPS+3	Triples
Agana (Guam)	NGM	29 (S)					
Albany	ALB	29 (S)			34		
Albuquerque	ABQ	29 (S)			*	57	
Anchorage	ANC	29 (S)				57	
Atlanta	ATL	57 (IP)					86p
Austin (new airport)	BSM	57 (IP)					
Baltimore	BWI	29 (S)		57p	*	*p	
Birmingham	BHM	29 (S)			34sh		
Boise	BOI	29 (S)					
Boston	BOS	29 (S)	*		*	57	
Buffalo	BUF	29 (S)			34sh		
Burbank	BUR	29 (S)			34		
Charleston	CHS	29 (S)			34		
Charlotte	CLT	57 (IP)			*	*	86p
Charlotte Amalie	STT	29 (S)					
Chicago	MDW	29 (S)			34sh		
Chicago	ORD	57 (IP)			*	*	86p
Cincinnati	CVG	57 (IP)			*		
Cleveland	CLE	29 (S)			*	57p	
Colorado Springs	COS	57 (IP)			*	57	
Columbus	CMH	42 (DP)		57p		*sh	
Dallas	DAL	42 (DP)		57	*		
Dallas-Fort Worth	DFW	57 (IP, IC)				*	86p
Dane County	MSN	29 (S)			*sh		
Dayton	DAY	57 (IP)			*	*	
Denver (new airport)	DEN	57 (IP)					86
Des Moines	DSM	29 (S)			34		
Detroit	DTW	57 (IP)			*		71p
El Paso	ELP	29 (S)	*sh			57	
Fort Lauderdale	FLL	42 (DP)		57	*		
Fort Myers	RSW	29 (S)		57p			

Table 3-7. Potential Siting of New IFR Approach Procedures and Their Associated IFR Arrival Capacity[2]

Airport	Airport Code	Current Best IFR Arrival Capacity (App Procedure)[3]	New IFR Approach Procedures Depen. Parallel	Indepen. Parallel	CRDA	TERPS+3	Triples
Grand Rapids	GRR	29 (S)		57p	*p	*p	
Greensboro	GSO	29 (S)		57p	*		
Greer	GSP	29 (S)		57p			
Harrisburg	MDT	29 (S)					
Hilo	ITO	29 (S)			34sh		
Honolulu	HNL	57 (IP)			*	*	
Houston Hobby	HOU	29 (S)			34		
Houston Intercont'l	IAH	57 (IP)				*	86p
Indianapolis	IND	42 (DP)		57p	*		
Islip	ISP	29 (S)			34sh		
Jacksonville	JAX	29 (S)		*p		57	
Kahului	OGG	29 (S)			34		
Kailua-Kona	KOA	29 (S)					
Kansas City	MCI	29 (S)		*p		57	
Knoxville	TYS	29 (S)	42				
Las Vegas	LAS	29 (S)			*	57p	
Lihue	LIH	29 (S)			*	57	
Little Rock	LIT	57 (IP)				*sh	
Los Angeles	LAX	57 (IP)					
Louisville	SDF	29 (S)		57p	*		
Lubbock	LBB	29 (S)			34		
Memphis	MEM	42 (DP)		*	*	57	
Miami	MIA	57 (IP)			*	*	
Midland	MAF	29 (S)	*		*	57sh	
Milwaukee	MKE	29 (S)	*	*p	*	57sh	
Minneapolis-St. Paul	MSP	42 (DP)		57	*		
Nashville	BNA	57 (IP)	*		*	57	
New Orleans	MSY	29 (S)		*p		57	
New York Kennedy	JFK	57 (IP)			*	*	
New York La Guardia	LGA	29 (S)			34		
Newark	EWR	29 (S)			*	57	

Table 3-7. Potential Siting of New IFR Approach Procedures and Their Associated IFR Arrival Capacity[2]

Airport	Airport Code	Current Best IFR Arrival Capacity (App Procedure)[3]	New IFR Approach Procedures: Depen. Parallel	Indepen. Parallel	CRDA	TERPS+3	Triples
Norfolk	ORF	29 (S)			34sh		
Oakland	OAK	29 (S)	*			57	
Oklahoma City	OKC	57 (IP)			*	*	
Omaha	OMA	29 (S)	42sh		*		
Ontario	ONT	29 (S)					
Orlando	MCO	57 (IP)					86p
Philadelphia	PHL	57 (IC)		*p	*	*sh	
Phoenix	PHX	42 (DP)		57			
Pittsburgh	PIT	57 (IP)			*		71p
Portland, OR	PDX	42 (DP)		57	*	*	
Portland, ME	PWM	29 (S)			34sh		
Providence	PVD	29 (S)	42		*		
Raleigh-Durham	RDU	42 (DP)		*	*sh		71p
Reno	RNO	29 (S)			34		
Richmond	RIC	29 (S)			*sh	57	
Rochester	ROC	29 (S)			*sh	57sh	
Sacramento	SMF	57 (IP)					
Saipan	GSN	29 (S)					
Salt Lake City	SLC	42 (DP)		*		*	71p
San Antonio	SAT	29 (S)		*p	*	57	
San Diego	SAN	29 (S)			34sh		
San Francisco	SFO	29 (S)			34		
San Jose	SJC	29 (S)					
San Juan	SJU	29 (S)				57	
Santa Ana	SNA	29 (S)					
Sarasota-Bradenton	SRQ	29 (S)			34sh		
Seattle-Tacoma	SEA	29 (S)	42p				
Spokane	GEG	29 (S)		57p	*	*p	
St. Louis	STL	29 (S)	*	*p	*	57	
Syracuse	SYR	29 (S)		57p	*		
Tampa	TPA	57 (IP)			*	*	71p

Table 3-7. Potential Siting of New IFR Approach Procedures and Their Associated IFR Arrival Capacity[2]

Airport	Airport Code	Current Best IFR Arrival Capacity (App Procedure)[3]	New IFR Approach Procedures Depen. Parallel	Indepen. Parallel	CRDA	TERPS+3	Triples
Tucson	TUS	29 (S)			*	57	
Tulsa	TUL	57 (IP)			*		86p
Washington National	DCA	29 (S)			34		
Washington Dulles	IAD	57 (IP, IC)				*	86p
West Palm Beach	PBI	29 (S)			34		
Wichita	ICT	57 (IP)			*	*	
Windsor Locks	BDL	29 (S)			34		

2. Generic (not airport-specific) capacities are used here to provide a basis of comparison only. These capacities, derived through the FAA Airfield Capacity Model, use a standard aircraft mix. Generally, runways not suitable for commercial operations were not considered. Also, factors such as winds and noise constraints are not taken into account.

3. Current Best Approach Abbreviations:

   DC - Dependent Converging Instrument Approaches

   DP - Dependent Parallel Runways

   IC - Independent Converging Runways

   IP - Independent Parallel Runways

   S - Single Runway

   - An asterisk (*) indicated proposed new approach procedures applicable at the airport in question; however, it also means that either the current best procedure, or another proposed approach procedure (under new rules), provides equal or better arrival capacity.
   - A number indicates that the hourly arrival capacity provided by a new approach procedure, when such capacity is larger than the one provided by other procedures (current or new), applicable at the airport in question.
   - A "p" indicates that the approach procedure will be applicable if and when planned runway construction/extensions take place at the airport in question.
   - An "sh" indicates that the approach procedure is applicable but that one of the runways is short (runway length less than 6,000 feet).